**California High-Speed Rail Program**

**RFP No.: HSR 13-57**

# Request for Proposal for Design-Build Services for Construction Package 2-3

# Book IV, Part D.3 – Independent Assurance Program Plan

04/02/2014 - RFP No.: HSR13-57

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# California High-Speed Rail Program

# Independent Assurance Program Plan
## Revision 0

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| Prepared By: | Patrick S. Lowry<br>Quality Program Manager | 2/19/2014<br>Date |
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Note: Signatures apply for the latest technical memorandum revision as noted above

Prepared by PARSONS BRINCKERHOFF

for the California High-Speed Rail Authority

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# 1.0 DEFINITIONS

**California High Speed Rail Authority** – The State entity responsible for planning, implementation, and operation of a high-speed rail system serving California's major metropolitan areas.

**Contractor** – A generic term used within this document to refer to construction contractors, material suppliers, and design-builders that deliver works to CHSRA.

**Independent assurance program** – Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program.

**Proficiency sample** – Homogenous samples that are distributed and tested by two or more laboratories and/or personnel. The test results are compared to assure that the laboratories and/or personnel are obtaining the same results.

**Project and Construction Management team** – Provides management and oversight of the Design-Builder for the California High Speed Rail Authority.

**Qualified laboratories** – Laboratories that are capable as defined by appropriate programs established by each PCM team. As a minimum, the qualification program shall include provisions for checking test equipment and the laboratory shall keep records of calibration checks.

**Qualified sampling and testing personnel** – Personnel who are capable as defined by appropriate programs developed by each PCM team.

**Quality assurance** – QA emphasizes actions at a management level that directly improve the chances that QC actions will result in a product or service that meets requirements. QA includes ensuring the project requirements are developed to meet the needs of all relevant internal and external agencies, planning the processes needed to assure quality of the project, ensuring that equipment and staffing is capable of performing tasks related to project quality, ensuring that contractors are capable of meeting and carrying out quality requirements, and documenting the quality efforts.

**Quality control** – Techniques that are used to assure that a product or service meets requirements and that the work meets the product or service goals. QC is the act of taking measurements, testing, and inspecting a process or product to assure that it meets specification. Products may be design drawings/calculations or specifications, manufactured equipment, or constructed items. QC also refers to the process of witnessing or attesting to, and documenting such actions.

**Random sample** – A sample drawn from a lot in which each increment in the lot has an equal probability of being chosen.

**Split sample** – Samples that are divided homogeneously from a single source and tested by two or more laboratories.

**Statistical sampling and testing** – Sampling and testing performed to validate the quality of the product.

**Vendor** – A supplier of project-produced material that is not the contractor.

# 2.0 ACRONYMS

**AASHTO** – American Association of Highway and Transportation Officials

**ASTM** – American Society of Testing and Materials

**CFR** – Code of Federal Regulations

**CHSR** – California High Speed Rail

**CHSRA** – California High Speed Rail Authority

**CHSRP** – California High Speed Rail Program

**D2S** – Difference Two-Sigma

**FHWA** – Federal Highway Administration

**FTA** – Federal Transit Administration

**FRA** – Federal Railway Administration

**IA** – Independent Assurance

**PCM** – Project and Construction Management

**QA** – Quality Assurance

**QC** – Quality Control

# 3.0 PURPOSE

The purpose of the Independent Assurance Program Plan is to outline the requirements of the Independent Assurance (IA) program for the California High Speed Rail Authority (CHSRA or Authority). The Code of Federal Regulations includes Titles 23 and 49, which are pertinent to the California High Speed Rail Project (CHSRP). While Title 49 is concerned with operations, Title 23 is focused on construction quality (specifically on projects that affect the National Highway System). Since aspects of construction projects within the CHSRP impact the National Highway System, a consistent approach to quality management requires that the IA program be based upon the provisions set forth in Title 23 Code of Federal Regulations Part 637 Subpart B – Quality Assurance Procedures for Construction (23 CFR 637).

# 4.0 RESPONSIBILITIES

The CHSRA Quality Manager is responsible for developing the IA program for the California High Speed Rail Project (CHSRP) as well as reviewing and monitoring the implementation of project-specific IA plans to ensure consistency and effectiveness.

The Project and Construction Management (PCM) teams are responsible for developing and implementing a project-specific IA Plan. In addition, they are responsible for maintaining a testing laboratory to perform the required functions of the IA program.

Laboratory managers are responsible for complying with the laboratory qualification requirements developed by the PCM.

The Design-Build contractor is responsible for cooperating and coordinating with the Authority's designated IA personnel to ensure that their material sampling and testing operations are conducted in accordance with contract requirements.

# 5.0 SCOPE

The IA program ensures that contractor and PCM sampling and testing is performed correctly and that the testing equipment used is operating correctly and remains calibrated. IA test results are not used for determining the quality and acceptability of the materials and workmanship on a project, but serve as checks on the reliability of the results obtained in project sampling and testing.

23 CFR 637 defines Quality Assurance (QA) and Quality Control (QC) as follows:

*Quality Assurance - All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.*

*Quality Control - All contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.*

These definitions for QA and QC differ slightly from those used by the Federal Transit Administration (FTA), as noted in the definitions section, which emphasize management level responsibilities. For consistency purposes, the Authority has adopted the FTA's definition for QA and QC throughout the CHSRP documents, including this IA Program Plan. Although the terminologies may differ slightly, the essential components of the IA program are in keeping with 23 CFR 637 and include the following elements:

- Maintaining a qualified testing laboratory
- Establishing IA sampling and testing frequencies
- Evaluating testing personnel
- Evaluating testing equipment

- Comparing and documenting test results obtained by the tester being evaluated and the IA tester
- Developing guidelines for the comparison of test results including tolerance limits

## 6.0 TESTING LABORATORIES AND PERSONNEL

Any laboratory which performs IA sampling and testing shall be accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FRA or FHWA as applicable.

All statistical sampling and testing data to be used in the IA program shall be executed by qualified sampling and testing personnel.

At a minimum, the personnel qualification program developed by the PCM should include the following concepts:

- Formal training of personnel including sampling and testing procedures with instructions on the importance of proper procedures and the significance of test results
- Hands-on training to demonstrate proficiency of all sampling and testing to be performed
- A period of on-the-job training with a qualified individual to assure familiarity with appropriate procedures
- A written examination and the demonstration of the various sampling and testing methods
- Requalification at regular intervals
- A documented process for removing personnel that perform the sampling and testing procedures incorrectly

## 7.0 FREQUENCY OF INDEPENDENT ASSURANCE TESTING

Federal regulations allow for two different approaches towards IA testing frequency, the system approach and the project approach. The difference in the two approaches is the basis for the frequency of testing: cover all personnel versus cover all projects.

Because the overall CHSRP is divided into multiple regions throughout the state with each region having its own set of independent construction packages, the project approach is considered more appropriate. This approach allows IA evaluations to be conducted on all projects and bases the schedule of IA testing upon the material acceptance testing frequency performed on an individual project or on a time frequency of an individual project. The IA evaluation frequency shall be noted within each PCM's project-specific IA Plan.

## 8.0 EVALUATION OF EQUIPMENT AND PERSONNEL

Testing equipment may be evaluated by using one or more of the following: calibration checks, split samples, or proficiency samples. Testing personnel's technique may be evaluated by observations of their testing of either split samples or proficiency samples. Specific evaluation procedures shall be documented in each PCM's project-specific IA plan.

## 9.0 COMPARISON OF TEST RESULTS

It is essential that the IA program compare results and detect deficiencies in PCM or contractor testing procedures in a timely manner. Deviations from the established tolerances require an engineering evaluation of the respective sampling and testing procedures and the equipment used against project requirements. When a comparison of contractor and verification data reveals significant differences in test values, the variables involved shall be evaluated by the IA personnel to determine whether further testing and investigation is needed to establish the source of the discrepancy. Corrective actions shall be incorporated as appropriate under the direction of IA personnel to eliminate testing discrepancies.

# 10.0 TOLERANCES FOR COMPARISON OF TEST RESULTS

Each PCM's project-specific IA plan shall include tolerances for comparison of test results. A common method for comparison tolerances is the Difference Two-Sigma (D2S) limits in the published test procedures. When split samples are used with this method, the materials and sampling variability are minimized as an analysis variable, thus only the variability due to the testing procedures and equipment differences are highlighted. The comparison of split sample test results should be based on established deviation values or tolerances that are representative of the testing procedures and materials used. American Association of Highway and Transportation Officials (AASHTO) and American Society of Testing and Materials (ASTM) have published precision statements for a variety of their test methods that are useful testing tolerance indicators.

The D2S method compares two test results from a single split sample. The limit indicates the maximum acceptable difference between two test results obtained on the same material (and thus, applies only to split samples), and can be used for single and multi-laboratory situations. It represents the difference between two individual test results that has approximately a 5% chance of being exceeded if the tests are actually from the same population. The formula for D2S is:

$$D2S = 2\sqrt{2}(1S)$$

where

1S = the standard deviation of the results

Another method is to distribute proficiency samples to participating testing laboratories. The resulting test data from these multiple laboratories can be analyzed to determine IA tolerances.

Established tolerances shall be evaluated annually by the PCM to ensure that the goals of IA are being met; that is, it assures the reliability of contractor and agency test results.

In situations where multiple split tests are performed on a project, a paired t-test can also be used to analyze data. This method compares two labs' results from an equal number of split samples. The test uses the differences between pairs of tests and determines whether the average difference is statistically different from zero. Thus, it is the difference within pairs, not between pairs, that is being tested. The calculated t-value is compared to the critical value obtained from a table of t-values for significant differences.

# 11.0 DOCUMENTATION

The IA laboratory manager is responsible for managing the documentation of all certified individuals qualified to perform required tests for materials acceptance. Certification records shall be maintained for the life of the project and in accordance with the Authority's Document Control Plan. Documentation to be maintained includes but is not limited to:

- Name of technician
- A sampling and testing personnel qualification summary in a format that lists all of the testing procedures the technician has been qualified to perform
- Copies of the qualification certificates issued by the IA laboratory with expiration dates
- Original written examinations for test procedures administered to each technician by the IA laboratory, with clear identification of technician's name, test administrator's name, score, and date the examination was taken
- Original performance examinations for test procedures administered to each technician by the IA laboratory, with clear identification of technician's name, test administrator's name, qualification status, and examination date
- Equipment requiring calibration/verification
- Test procedures and/or test manuals
- Split sample test results
- IA procedure checklists
- IA equipment checklists

The IA laboratory will also maintain a record for each laboratory that has participated in the program. At a minimum, the file will contain:

- Name of laboratory
- Physical location of laboratory
- Name of contact person and contact information
- Name of laboratory qualifier
- Laboratory inspection reports
- Deficiencies and associated follow-up documentation
- Copies of any qualification certificates issued
- Copies of all equipment certifications with their expiration dates if applicable

# ATTACHMENT 1

## Example Procedure Checklist

### Performance Checklist
### ASTM C-39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

| Item | | P | F | N/A |
|---|---|---|---|---|
| 1. | Remove specimen from moist storage, but keep moist; check specimen for perpendicularity to the axis and planeness of ends; determine diameter to nearest o.25 mm (0.01 inch) by averaging two diameters measured at right angles to each other at about mid-height of the specimen. | | | |
| 2. | Wipe clean the bearing faces of the upper and lower bearing blocks and of the test specimen. | | | |
| 3. | Place test specimen on lower bearing block. | | | |
| 4. | Align the axis of the specimen with the center of thrust of the top (spherically seated) block. | | | |
| 5. | Verify that the load indicator is set to zero. | | | |
| 6. | Bring top block to bear gently and uniformly on specimen while gently rotating the movable portion by hand. | | | |
| 7. | Apply load continuously and without shock, at a rate of movement corresponding to a stress rate of 0.25 ± 0.05 MPa/s (35 ± 7 psi/sec), during the latter half of the anticipated loading phase. Make no adjustment in the rate of movement as the ultimate load is being approached and the stress rate decreases due to cracking. Apply the load until complete failure occurs and the specimen displays a well-defined fracture pattern. | | | |
| 8. | Record maximum load. | | | |
| 9. | Note the type of fracture pattern. | | | |
| 10. | Calculate the compressive strength and report with required precision according to ASTM C39. | | | |

**Remark:** **Compressive Strength = ± 10%**

Date:__________ Technician:______________________________ IA Observer:___________________________________

Technician's E-mail Address:____________________________________________________________________________

Employer's/ Supervisor's E-mail Address: __________________________________________________________________

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# ATTACHMENT 2

## Example Equipment Checklist

**Equipment Checklist**
**ASTM C-39 Compressive Strength of Cylinder Specimens**

| | | P | F | N/A |
|---|---|---|---|---|
| **Testing Machine** | | | | |
| 1. | The testing machine shall be of a type having sufficient capacity and capable of providing the rates of loading prescribed in 7.5. | | | |
| 2. | Verify calibration of the testing machines in accordance with Practices E-4. | | | |
| 3. | The machine must be power operated and must apply the load continuously rather than intermittently, and without shock. | | | |
| 4. | The testing machine shall beequipped with two steel bearing blocks with hardened faces, one of which is a spherically seated block that will bear on the upper surface of the specimen, and the other a solid block on which the specimen shall rest. | | | |
| 5. | Bearing faces of the blocks shall have a minimum dimension at least 3% greater than the diameter of the specimen to be tested. | | | |
| 6. | Except for the concentric circles, the bearing faces shall not depart from a plane by more than 0.001 inches [0.02 mm] in any 6 inches [150 mm]Of blocks 6 inches [150 mm] in diameter or larger, or by more than 0.001 inches [0.02 mm] in the diameter of any smaller block. New blocks shall be manufactured within one half of this tolerance. When the diameter of the bearing face of the spherically seated block exceeds the diameter of the specimen by more than 0.5 inches [13 mm], concentric circles not more than0.03 inches [ 0.8 mm] deep and not more than 0.04 inches [1 mm] wide shall be inscribed to facilitate proper centering. | | | |
| 7. | The bottom bearing block is specified for the purpose of providing a readily machinable surface for maintenance of the specified surface conditions. The top and bottom surfaces shall be parallel to each other. If the testing machine is so designed that the platen itself is readily maintained in the specified surface condition, a bottom block is not required. Its least horizontal dimension shall be at least 3 % greater than the diameter of the specimen to be tested. Concentric circles are optional on the bottom block. | | | |
| 8. | Final centering must be made with reference to the upper spherical block. When the lower bearing block is used to assist in centering the specimen, the center of the concentric rings, when provided, or the center of the block itself must be directly below the center of the spherical head. Provision shall be made on the platen of the machine to assure such a position. | | | |
| 9. | The bottom bearing block shall be at least 1 inch [25 mm] thick when new, and at least 0.9 inch [22.5 mm] thick after any resurfacing operations. | | | |
| 10. | At least every six months, or as specified by the manufacturer of the testing machine, clean and lubricate the curved surfaces of the socket and of the spherical portion of the machine. The lubricant shall be a petroleum-type oil such as conventional motor oil or as specified by the manufacturer of the testing machine. | | | |
| 11. | The movable portion of the bearing block shall be held closely in the spherical seat, but the design shall be such that the bearing face can be rotated freely and tilted at least 4° in any direction. | | | |
| 12. | If the load of a compression machine used in concrete testing is registered on a dial, the dial shall be provided with a graduated scale that is readable to at least the nearest 0.1% of the full scale load, The dial shall be readable within 1% of the indicated load at any given load level within the loading range, In no case shall the loading range of a dial be considered to include loads below the value that is 100 times the smallest change of load that can be read on the scale, The scale shall be provided with a graduation line equal to zero and so numbered | | | |
| 13. | If the testing machine load is indicated in digital form the numerical display must be large enough to be easily read, The numerical increment must be equal to or less than 0.10% of the full scale load of a given loading range, In no case shall the verified loading range include loads less than the minimum numerical increment multiplied by 100, Maximum load indicator provided so that at all times will indicate within 1% system accuracy the maximum load applied to the specimen | | | |

**Remarks:**

Date: ______________ Technician: __________________________ IA Observer: __________________________

Technician's E-mail Address: ______________________________________________________________________

Employer's/Supervisor's E-mail Address: ______________________________________________________________

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# REFERENCES


1) "23 CFR Part 637," *Subpart B – Quality Assurance Procedures for Construction*, Federal Highway Administration, Washington DC, July 2006, http://www.fhwa.dot.gov/pavement/0637bsup.cfm.

2) "Construction Quality Assurance for Design-Build Highway Projects," *Publication No. FHWA-HRT-12-039*, Federal Highway Administration, Washington DC, April 2012, http://www.fhwa.dot.gov/publications/research/infrastructure/12039/12039.pdf.

3) "Independent Assurance Programs," *Publication No. FHWA-HIF-12-001*, Federal Highway Administration, Washington DC, October 2011, http://www.fhwa.dot.gov/pavement/materials/hif12001.pdf.

4) "Use of Contractor Test Results in the Acceptance Decision, Recommended Quality Measures, and the Identification of Contractor/Department Risks," *Publication No. T 6120.3*, Federal Highway Administration, Washington DC, August 2004, http://www.fhwa.dot.gov/construction/t61203.cfm.

5) *Questions and Answers on the Quality Assurance Regulation (23 CFR 637)*, Federal Highway Administration, Washington DC, April 2011, http://www.fhwa.dot.gov/pavement/materials/qanda637.cfm.

6) "Independent Assurance Program," *Topic No. 674-000-000*, Florida Department of Transportation, Florida, January 2013, http://www.dot.state.fl.us/statematerialsoffice/administration/resources/library/publications/materialsmanual/documents/v1-section55-clean.pdf.

7) "Quality Assurance Program," *Manual Notice 2005-1*, Texas Department of Transportation, Texas, June 2005, http://onlinemanuals.txdot.gov/txdotmanuals/qap/qap.pdf.

8) *TxDOT Design-Build Quality Assurance Program Implementation Guide*, Texas Department of Transportation, Texas, November 2011, http://ftp.txdot.gov/pub/txdot-info/cst/db_qap_guide.pdf.